

SESSION 1: Biomaterial Interfaces/Devices and Surfaces for Biotechnology

*Session Program Committee: Gabriel P. López (Chair), University of New Mexico
Terry A. Michalske, Sandia National Laboratories
Basil Swanson, Los Alamos National Laboratory
David Whitten, Los Alamos National Laboratory*

Invited Speakers

PROFESSOR CHARLES T. CAMPBELL
Center for Nanotechnology
University of Washington

PROFESSOR DAVID J. ODDE
Department of Biomedical Engineering
University of Minnesota

Recent years have witnessed increased biotechnological activity within the New Mexico scientific and technical community. This activity includes research into biosensors, micro-bioanalytical systems, biomaterials, genomics and proteomics. These topics have potential implications and direct linkages to the more traditional AVS/NMC strengths in surface science, thin films, and materials processing. The goal of this session is to provide an overview of the breadth of local activities that are related to the interests of the International Biomaterial Interfaces Group of the AVS (see page 23 of the Program for the 46th International Symposium of the AVS). A diverse set of speakers representing efforts that exemplify the new level of biotechnological activities in New Mexico are encouraged to participate.

Session Chair: Gabriel P. López, University of New Mexico

- 8:20 **Kinetics of Adsorption/Desorption Processes at the Liquid/Solid Interface**, Charles T. Campbell, University of Washington (INVITED)
- 9:00 **Biosensors Based on Laser Scanning Microscope**, A.V.V.Nampoothiri, A.Ukhanov, and W.Rudolph, The University of New Mexico
- 9:20 **Electrical Bioanalytical Devices for Quantitative Detection of Bacteria and Viruses**, Ebtisam Wilkins, Srinivas Vetcha, Dmitri Ivnitcki, University of New Mexico
- 9:40 **Tunable Polymer Surfaces: The Effect of Background Hydrophobicity on the Wettability of Tethered Smart Polymers**, Linnea K. Ista, Sergio Mendez, and Gabriel P. López, The University of New Mexico
- 10:00 Break
- 10:20 **Laser-Guided Direct Writing of Living Cells**, David J. Odde, University of Minnesota, (INVITED)
- 11:00 **Plug Flow Cytometry for Automated High Throughput Sample Screening**, Fritz Kuckuck, Bruce S. Edwards, Larry A. Sklar, The University of New Mexico
- 11:20 **Rapid Prototyping of Microfluidic Components**, William Jackson, Hy D. Tran and Gabriel P. López, The University of New Mexico
- 11:40 **Encapsulation of Poly(N-isopropyl acrylamide) in Silica: A Stimuli-Responsive Porous Hybrid Material That Incorporates Molecular “Nano-Valves”**
G.V. Rama Rao and Gabriel P. López, University of New Mexico

SESSION 2: Nanometer Scale Science and Technology

*Session Program Committee: Mark T. Paffett, Los Alamos National Laboratory
Neal D. Shinn, Sandia National Laboratories*

Invited Speakers

PROFESSOR FRANZ HIMPSEL
Department of Physics
University of Wisconsin

DR. DAVID JESSON
Oak Ridge National Lab

The emerging fields of nano-science and nano-technology have had, and will continue to have, a profound influence on the miniaturization of the electronic devices ubiquitous in the modern world. In this session we will cover novel uses of nano-technology in information storage, molecular scale electronics (quantum wires and dots), nano-patterning (lithography), and uses of nano-tubule technologies (sensors and emitters). The impact of these technologies in traditional electronic areas and their potential import into unique and non-traditional areas will be addressed. The cross fertilization of concepts and technologies in miniaturized sensing and control functions will be emphasized in concert with Session 1 and Session 3.

**Session Co Chairs: Mark T. Paffett, Los Alamos National Laboratory
Neal D. Shinn, Sandia National Laboratories**

- 1:40 **Spectroscopic Ellipsometry and Fluorescence Study of Thermochromism in an Ultrathin Poly(diacetylene) Film: Reversibility and Transition Kinetics,** T. M. Mayer¹, R. W. Carpick², D. Y. Sasaki¹, and A. R. Burns¹, ¹ Sandia National Laboratories, ² Department of Engineering Physics, University of Wisconsin
- 2:00 **Electrical Characterization of Self-Assembled Alkanethiol Monolayers Using Interfacial Force Microscopy,** K. Son*, H. I. Kim, and J. E. Houston, Sandia National Laboratories
- 2:20 **Self-assembled Nanostructures at Stepped Surfaces,** Franz J. Himpsel, University of Wisconsin Madison (INVITED)
- 3:00 Break
- 3:20 **“Direct Observation of Sub-Critical Fluctuations During Quantum Dot Formation,** D. E. Jesson, Oak Ridge National Laboratory (INVITED)
- 4:00 **The Pb on Cu(100) System: Surface Morphology, Alloying, and Dealloying,** Richard Plass and Gary L. Kellogg, Sandia National Laboratories
- 4:20 **Grain Boundary De-faceting: A First Order Phase Transition by Atomic Shuffle,** Istvan Daruka and J. C. Hamilton, Sandia National Laboratory, Livermore, CA 94550
- 4:40 **Nanofabricated SiO₂-Si-SiO₂ Resonant Tunneling Diodes,** J.G. Fleming, E. Chow and S.-Y. Lin, Sandia National Laboratories



SESSION 3: Micro-Electro-Mechanical Systems (MEMS)/ Stiction, Friction, and Wear in Micromachines

*Session Program Committee Chair: Bruce C. Bunker,
Sandia National Laboratories*

Invited Speakers

PROFESSOR SCOTT PERRY
Department of Chemistry
University of Houston

PROFESSOR XIAOYANG ZHU
Department of Chemistry
University of Minnesota

Within the last ten years, there has been a revolution in the development of machinery that can be fabricated on semiconductor chips. However, as component sizes decrease and micromachine complexity increases, it is becoming more apparent that interfacial interactions are critical to the fabrication, performance, and reliability of such devices. The goal of this session is to highlight the role that surfaces play in controlling phenomena such as stiction, friction, and wear in micromachines. Papers are being solicited involving topics such as: 1) the basic science of adhesion, friction, and wear, 2) the modification of surfaces to control phenomena such as friction and stiction, and 3) applied research dealing with the relationships between interfacial interactions and the performance of actual micromachines. The latter topic will highlight recent developments in micromachines, particularly those achieved at Sandia, Los Alamos and UNM.

Session Chair: Bruce C. Bunker, Sandia National Laboratories

- 8:20 **State-of-the-Art Actuation Systems for MEMS**, M. Steven Rodgers, Intelligent Micromachine Department, Sandia National Laboratories
- 9:00 **Self-Assembled Monolayers on Silicon Surfaces**, X.-Y. Zhu, University of Minnesota (INVITED)
- 9:40 **Friction and Wear Properties of Alkane Monolayers on Silicon**, H. I. Kim^a, J. E. Houston^a, X. -Y. Zhu^b, J. D. Kiely^c, ^aSandia National Laboratories, ^b *Department of Chemistry, University of Minnesota*, ^c Seagate Research
- 10:00 **Chemical Vapor Deposition of Monolayer Films of Fluoroalkylsilanes for Adhesion Control in MEMS Technology**, T. M. Mayer, M. P. de Boer, N. D. Shinn, T. A. Michalske, Sandia National Laboratories
- 10:20 **Atomic- and Molecular-Level Insight into Discreet Frictional Events**, Scott S. Perry, Department of Chemistry, University of Houston (INVITED)
- 11:00 **Adhesion hysteresis of silane coated microcantilevers**, M. P. de Boer, J. A. Knapp, and T. A. Michalske, Sandia National Laboratories, U. Srinivasan and R. Maboudian Dept. of Chemical Engineering, UC, Berkeley
- 11:20 **The Influence of Coating Structure on Micromachine Stiction**, Jim Kushmerick, Matt Hankins, Maarten De Boer, Peggy Clews, and Bruce Bunker, Sandia National Laboratories
- 11:40 **Mechanical properties of “amorphous diamond” films for MEMS applications**, R.J. Hohlfelder, T.A. Friedmann , J.P. Sullivan, Sandia National Laboratories

SESSION 4: Advanced Materials, Processing, and Analysis for Semiconductors

*Session Program Committee: Seethambal S Mani (Chair), Sandia National Laboratories
Matthew G. Blain, Sandia National Laboratories
Randy J. Shul, Sandia National Laboratories
Jerry M. Soden, Sandia National Laboratories*

Invited Speakers

PROFESSOR HERBERT H. SAWIN
Department of Chemical Engineering
Massachusetts Institute of Technology

PROFESSOR JANE P. CHANG
Department of Chemical Engineering
University of California at Los Angeles

This session is broad in scope in that invited and contributed papers will cover a range of topics that have historically been covered in the AVS/NMC Symposium. These topics include novel semiconductor devices, new analytical techniques for materials and devices, and advances in the materials, diagnostics, and processing of semiconductors, including silicon and compound semiconductors. Papers are being solicited involving topics such as: 1) rapid analysis tools and techniques for wafer fabrication, 2) enabling process techniques (such as plasma processing and chemical mechanical polishing), 3) modeling of fabrication processes and semiconductor devices, and 4) surface and plasma science applied to the understanding of semiconductor devices and fabrication processes.

Session Chair: Matthew G. Blain, Sandia National Laboratories

- 1:20 **Electron Stimulated Dissociation of Ammonia and Nitric Oxide Adsorbed on Ge(100) Surface**, M. Sanders, C. Bater, J. H. Craig, Jr., Department of Physics, Materials Research Institute, University of Texas at El Paso
- 1:40 **HF Vapor Etching and Cleaning of Silicon Wafer Surfaces**, Herbert H. Sawin, Department of Chemical Engineering, Massachusetts Institute of Technology (**INVITED**)
- 2:20 **Actively Biased p-Channel MOSFETs Studied with Scanning Capacitance Microscopy**, C.Y. Nakakura, D.L. Hetherington, M.R. Shaneyfelt, P.E. Dodd, and P. DeWolf, Sandia National Laboratories, Digital Instruments, Inc.
- 2:40 **Multi-level Patterning Using Deep Reactive Ion Etching**, C.G. Willison, R.J. Shul, Kent Schubert, Mary Anne Mitchell, Sandia National Laboratories
- 3:00 **Effects of Feed Gas Composition on Impurity Concentration, Structure, and Dielectric Constant of Fluorinated SiO₂ Films Deposited from SiF₄/SiH₄/O₂/Ar Plasmas**, Sang M. Han, University of New Mexico, Eray S. Aydil, University of California, Santa Barbara,
- 3:20 **Characterization of RTP Grown Oxynitride Gate Dielectrics in NO/O₂ Ambients**, S.C. Everist, T.L. Meisenheimer, Paul Martin Smith, G.C. Nelson, Sandia National Laboratories, Rahul Sharangpani, Sing Pin Tay Steag RTP Systems Inc.
- 3:40 **Ultra-thin Metal Oxides as New Dielectrics in Microelectronic Applications**, J. P. Chang, Department of Chemical Engineering, University of California, Los Angeles (**INVITED**)
- 4:20 **The Proper Diagnosis of Stress Voiding in IC Interconnects**, William F. Filter, Sandia National Laboratories